Yacovone, Krista

From:	DiPippo, Gary <Gary.DiPippo@Cornerstoneeg.com>
Sent:	Wednesday, April 03, 2013 3:57 PM
To:	Gorin, Jonathan
Cc:	John M. Hoffman; Carrie McGowan; smacmillin@brwncald.com
Subject:	Unofficial LCP FS Draft Response to Comments
Attachments:	Draft LCP FS RTC 032613.pdf

Good afternoon Jon.

Per the e-mail below, Carrie had indicated we were working on the FS comments and would contact you with issues, if any. As we were developing the draft, it seemed worthwhile to send you an "unofficial" version of the response to comments. From this, you can let us know if there are any issues relative to the manner in which the comments are being addressed, before this is made as a submittal to EPA, and we can discuss them.

I should note that the COPC and PRG lists are the old ones as placeholders. We are working on the expanded lists and hope to have final drafts maybe the end of this week. However, these drafts need to be checked against the final RI and BERA which are still not quite final. In any event, we can also send preliminary copies of those lists when they are complete, if it would help.

Let us know if you need anything else.

Thanks, Gary

From: Carrie McGowan [mailto:Carrie.McGowan@ehs-support.com]
Sent: Friday, March 29, 2013 12:28 PM
To: Gorin, Jonathan; John M. Hoffman
Cc: smacmillin@brwncald.com; pthorn@brwncald.com; DiPippo, Gary; mschuck@geosyntec.com; ktolson@geosyntec.com
Subject: RE: LCP Ditch comments

Yes we can.
Just let us know how many and what type of copies for the final reports. Less hard copies the better!
We are just now reviewing the response to FS comments that Gary has prepared. John or I will call you with any issues on the FS comments shortly. I don't expect much as we already saw them and discussed them with you, however that was before John was involved and we actually wrote out responses.
Thanks,
Carrie

From: Gorin, Jonathan [mailto:Gorin.Jonathan@epa.gov]
Sent: Friday, March 29, 2013 11:38 AM
To: Carrie McGowan; John M. Hoffman
Cc: smacmillin@brwncald.com; pthorn@brwncald.com; DiPippo, Gary (Gary.DiPippo@Cornerstoneeg.com); mschuck@geosyntec.com; ktolson@geosyntec.com
Subject: RE: LCP Ditch comments

That's appreciated. Could you send it just on a disc?

When it's all approved, I'll need at least one hard copy of all final documents and also an electronic copy. I'll see if Anne is ok *not* getting a hard copy (or five). I can't remember what the AOC calls for, regardless I'll send you a letter so you won't be out of compliance.

Are there issues on the FS comments I should know about?

From: Carrie McGowan [mailto:Carrie.McGowan@ehs-support.com]
Sent: Friday, March 29, 2013 11:24 AM
To: Gorin, Jonathan; John M. Hoffman
Cc: smacmillin@brwncald.com; pthorn@brwncald.com; DiPippo, Gary (Gary.DiPippo@Cornerstoneeg.com); mschuck@geosyntec.com; ktolson@geosyntec.com
Subject: RE: LCP Ditch comments

Jon,
Thank you for the Ditch comments now we can work on a final RI. We are planning for the BERA and RI to send you a red-lined version with notes on which comments are addressed where. The ditch work will be included with the RI. Once you review that and tell us it is fine we will produce the final documents for distribution. BERA will come first, then RI. For the FS we are going to send you a response to comments.
Hopefully it will be fairly easy to follow.
Thanks,
Carrie

From: Gorin, Jonathan [mailto:Gorin.Jonathan@epa.gov]
Sent: Friday, March 29, 2013 11:13 AM
To: Carrie McGowan; John M. Hoffman
Subject: LCP Ditch comments

Carrie, John there's one comment, which I think you already have, but in case not:

On Figure 5-21 and 5-22, please put in units for water elevation (y-axis). I'm certain they're feet, but may as well be clear.

Once that done, it's approved. I'll send the official approval with the letter approving the other documents from Carole.

For those other documents, as we discussed, I'd suggest sending me a disc containing the text/diagrams as final documents. I'll go through them, if they addressed the comments I'll send a letter back with the approval(s).

jon

CORNERSTONE
Engineering Group, LLC

90 Crystal Run Road, Suite 201 • Middletown, NY • 10941 • (877) 294-9070 • Fax: (845) 692-5894

April X, 2013

Ms. Carole Petersen
Chief, New Jersey Remediation Branch
United States Environmental Protection Agency, Region 2
290 Broadway
New York, New York 10007-1866

Re: Response to USEPA Comments
Draft Feasibility Study Report
LCP Chemicals, Inc. Superfund Site

On behalf of ISP Environmental Services (IES), enclosed are responses to the comments on the Draft Feasibility Study (FS) Report for the LCP Chemicals, Inc. Superfund Site, which were attached to your letter dated February 11, 2013.

In developing the responses to comments several sections of the FS have been revised in advance of completing the Final FS Report, as an aid in your review. These revised sections of the FS Report are attached as follows:

Attachment 1 – Revised Section 4.0, which includes new Section 4.2, Preliminary Remediation Goals, and new Table 4-2
Attachment 2 – New Section 2.6, Summary of Potential Contaminants of Concern, and new Table 2-4
Attachment 3 – Principal Threat Waste revisions to Sections 2.3.1 and 2.7.1.2 of the draft FS Report
Attachment 4 – Revised Section 3.1, Remedial Action Objectives

If you or your staff has any questions or comments, please do not hesitate to contact John Hoffman of Ashland or the undersigned.

Sincerely,

CORNERSTONE ENGINEERING GROUP, LLC

Gary J. DiPippo, Professional Engineer
NJ License No. 24GE02646100
Manager, Hydrogeology & Remediation

cc: J. Hoffman
C. McGowan
S. MacMillin

LCP Chemicals Inc. Superfund Site
Draft Feasibility Study
Response to USEPA Comments Dated February 13, 2013

Note: comments shown in Bold Italics, responses shown in standard font.

<u>*General comments:*</u>

- ***Need to develop PRGs (including for stream sediments based on the BERA (see next bullet)). These would typically be developed in Section 4, after the ARARs section.***

A new Section 4.2 will be added to the FS report entitled "Preliminary Remediation Goals", a copy of which is attached (Attachment No. 1) for review. PRGs will be established for each COPC identified in the RI. A COPC will be a constituent that has a baseline incremental risk above the risk thresholds (human health or ecological) or exceeds a relevant or appropriate remediation standard or guidance value. The COPC list will also identify whether a COPC is associated with the operations at the site or is not site-operations related (e.g., associated with the anthropogenic fill). A preliminary COPC list is attached for review (see Attachment No. 2 and response to COC comment below), and will be finalized based on the final RI.

Based on the COPC list, a new table (also see Attachment No. 1) will be added to Section 4.2 of the report summarizing the PRGs for the various COPCs. As noted in the PRG discussion and table, the impact to groundwater guidance values are largely irrelevant given that anthropogenic fill has been placed at the site and by default in New Jersey a Classification Exception Area (CEA) is established for an indeterminate period of time for a site with anthropogenic fill site as a part of the presumptive remedy. In addition, groundwater has been separately evaluated by comparison to groundwater quality standards as well as in the risk assessment, and therefore, there is no need to project potential groundwater impacts from soil data. Consequently, the impact to groundwater soil standards are provided for information, but are not used in selecting PRGs. This approach to PRGs was previously discussed with the USEPA and was conceptually agreed to in an electronic mail message dated October 2, 2012.

- ***Pursuant to N.J.A.C.7:26E-4.8, numerical ecological risk-based preliminary remediation goals (PRGs) must be developed for sediment and low marsh soil to serve as target concentrations for the remediation and to provide volume estimations for contaminated media. PRGs should be developed for contaminants that the Baseline Ecological Risk Assessment (BERA) identified as posing unacceptable food chain or direct exposure risk. For each contaminant where dietary exposure models indicated a hazard quotient (HQ) >1, PRGs should be determined via back-calculation using the food chain models. For elevated levels of non-biomagnifying contaminants (i.e. arsenic, barium, zinc and other inorganics), where a complete set of sediment toxicity test data could not be acquired due to laboratory refusal of samples, PRGs still need to be determined. (Note: Barium data were not reported in FS Appendix A Tables, yet the draft BERA indicated highly elevated barium sediment concentrations (e.g., numerous data points approximately three orders of magnitude above the sediment ER-M of 48 mg/kg).)***

The ecological PRGs will be updated based on the food chain modeling when this additional work is completed as a part of the RI.

Pursuant to the NJDEP Ecological Evaluation Technical Guidance, August 2011, (NJDEP August 2011), if the PRGs cannot be achieved, the FS must identify risk management decision (RMD) goals.

As described in the FS, each of the soil alternatives evaluated includes a cap. A cap would render the terrestrial ecological exposure pathway incomplete, and thereby, achieve the PRGs. Similarly, each of the sediments alternatives includes excavation of sediments and low marsh soils and restoration of the stream channel and adjacent wetlands. Consequently, sediments PRGs would be achieved as well. Given the above, we do not see a need for identification of risk management decision goals.

- ***Need to clearly identify COCs***

A new Section 2.6 will be added to the FS entitled “Summary of Contaminants of Potential Concern”. A proposed draft of this section of the FS is attached for review (Attachment No. 2), along with a table summarizing the COPCs by medium and characterizing each as “site operations related” or not. As noted above, a COPC will be a constituent that has a baseline incremental risk above the risk thresholds (human health or ecological) or exceeds a relevant or appropriate remediation standard or guidance value.

- ***Arsenic should be considered a site contaminant.***

As described in detail in the RI and further discussed in the October 11, 2012 final response to comments on the RI provided by Brown and Caldwell, Arsenic is a COPC, is associated with the site by virtue of the anthropogenic fill and other sources, but is not related to the LCP site operations. Arsenic is also retained as a COPC in the FS. The FS language related to arsenic as a site contaminant will be made consistent with the final, approved RI when it is complete.

- ***Need to discuss wetland replacement to replace the areas along SBC that will be filled.***

The sediments remediation alternatives are discussed in Section 6.3 of the FS. Each of these alternatives includes a discussion of restoration and mitigation of impacted wetlands following the remediation work. This discussion will be expanded to include additional detail. The proposed language is as follows:

> “Following the remediation of the South Branch Creek and Northern Off-Site Ditch sediments, the adjacent, impacted wetlands would be restored/mitigated to the extent practicable so these wetlands are representative of an intermediate resource value wetland. Restoration would occur where the wetlands are temporarily disturbed to complete the sediments remediation. To the extent an alternative would fill an existing wetland, compensatory mitigation would be performed. Mitigation could be in the form of a wetland bank, in-lieu fee, on-site mitigation, or mitigation at an alternative location. The mitigation could also include enhancing the resource value of the wetland. In New Jersey, restoration is typically at a ratio of 2:1 (restoration to disturbance), enhancement at a ratio of 3:1 to 10:1, and banking at a ratio of 1:1. The details of the wetland restoration and mitigation would be defined as a part of the remedy design and implementation approval (e.g., permit equivalent) process.”

- ***Need to better define the cap, e.g., impermeability, etc. Will it comply with NJDEP tech regs?***

Remedial alternatives with a cap are described in Section 6.1 of the FS report. In this section, the cap is described as having 24 inches of certified clean fill and capable of supporting vegetation, a geosynthetic membrane [essentially impermeable], a geocomposite drainage layer, and grading for proper drainage. The text also indicates that the "details of the cap would be developed during design and would be integrated with Site redevelopment, where applicable." This would appear to provide the definition requested by this comment. However, the text will be edited to indicate that a cap would meet the NJDEP technical requirements.

- ***Need to indentify elemental, visible mercury as a Principal Threat Waste (PTW).***

A discussion of Principal Threat Waste will be added to Sections 2.3.1 and 2.7.1.2 of the FS report. A redline version of the proposed revisions to these sections is attached for review (Attachment No. 3).

- ***Need to make it more clear that both site and non-site related (i.e. fill) wastes will be addressed by the alternatives due to the co-location.***

Throughout the FS report the non-site-operations related impacts are included in the summary of the nature and extent of contamination and in the development and evaluation of alternatives, as is the fact that non-site-operations related constituents are co-located with, for example, mercury (see discussion in Section 2.3.1 of the FS report). We believe sufficient language currently exists in the FS regarding this comment.

- ***Need a complete explanation of Ground Water Quality Criteria for Class III-B areas:***
  "The ground water quality criteria for Class III-B shall be determined on an area by area basis in response to case by case needs, in the context of applicable regulatory programs. In each case, the criteria shall be no more stringent than necessary to ensure that there will be no:
    1. impairment of existing uses of ground water;
    2. resulting violation of Surface Water Quality Standards;
    3. release of pollutants to the ground surface, structures or air in concentrations that pose a threat to human health;
    4. violation of constituent standards for downgradient classification areas to which there is a significant potential for migration of ground water pollutants."

The groundwater quality criteria for the Class IIIB water bearing zone at the site is discussed in Section 2.3.3 of the FS report. This section will be edited to address each of the groundwater quality criteria for Class IIIB aquifers as defined at N.J.A.C. 7:9C-1.7(f). Section 2.3.3 of the FS report has been excerpted and is presented below with proposed revisions shown in redline text.

> As noted above, the bedrock water-bearing zone is classified as a Class IIIB aquifer and, therefore, published numeric water quality criteria are not available for comparison. Rather, Class IIIB groundwater quality criteria are defined at N.J.A.C. 7:9C-1.7(f) as follows:
>
> "…the criteria shall be no more stringent than necessary to ensure that there will be no:
>
> 1. Impairment of existing uses of ground water;

2. Resulting violation of Surface Water Quality Standards;
3. Release of pollutants to the ground surface, structures or air in concentrations that pose a threat to human health;
4. Violation of constituent standards for downgradient classification areas to which there is a significant potential for migration of ground water pollutants.

Each of these criteria is discussed further below.

Criterion No. 1

As reported in the RI, Section 2.8, potable water in the site vicinity is provided by New Jersey American Water. There are no water supply wells down-gradient of the site, and the brackish nature of the bedrock aquifer in the vicinity of the Arthur Kill limits groundwater use in the area. As such, there are no existing uses of the Class IIIB aquifer which could be impaired by the site.

Criterion No. 2

As noted in N.J.A.C. 7:9C-1.7(f)2, Class IIIB Aquifers that discharge to surface water, as is the case at the LCP site, are regulated so as not to exceed Surface Water Quality Criteria applicable to that water body (N.J.A.C. 7:9-6.7(g)). Data for wells along the down-gradient perimeter of the site, closest to the surface water discharge point (MW-25D, MW6D and MW-21D) are compared to saline surface water criteria in Table 2-2. As shown in Table 2-2, only arsenic in MW-25D and manganese in each of the three wells are found in concentrations above any of the surface water quality criteria. These are not site-related constituents and are most likely associated with the fill or are naturally occurring. The data, therefore, do not indicate the potential for an impact on surface water quality from groundwater discharge from the bedrock.

Bedrock groundwater quality data are summarized in Table 2-3 (detections), with representative constituents (mercury, chlorobenzene, benzene), and their respective concentrations, illustrated in Figure 2-11. These representative constituents are the most commonly detected in the bedrock groundwater and while other miscellaneous compounds are detected, these constituents help to illustrate groundwater quality impacts in the bedrock water bearing zone. Review of the figures illustrates that the higher concentrations of chlorobenzene and mercury, in particular, are found in wells north and west of the former production area within the up-gradient portion of the Site. By contrast, as shown on Figure 2-5, mercury in the overburden soils predominates in the former production area, and as previously mentioned, is principally present as low solubility/insoluble species not generally manifested in overburden groundwater. Chlorobenzene is not associated with the LCP Site, and shows a similar pattern of distribution; highest concentrations in the northwestern, up-gradient portion of the Site. Constituent concentrations decrease significantly under the central portion of the Site and are at trace or non-detectable levels along the down-gradient property boundary adjacent to surface water.

This distribution of groundwater quality impacts is indicative of impacts associated with the adjacent LPH site and is not associated with LCP. Chlorobenzene is associated with the adjacent LPH site, as is more soluble mercury. When viewed in the context of the bedrock water-bearing zone potentiometric surface illustrated in Figure 2-4, the groundwater quality data show that the origin of the groundwater quality impacts is from up-gradient and is not associated with the LCP Site. Following the groundwater flow paths illustrated on Figure 2-4, one sees that groundwater flows on to the LCP site, sweeps to the southeast and then is caught up in the flow path toward the LPH groundwater extraction well DEW-4A. These flow paths are consistent with where constituents such as chlorobenzene and mercury are detected (MW-17D, MW-18D, and MW-20D). The only bedrock wells that contain detectable levels of mercury are located northwest of the LCP production area. Groundwater in the bedrock water-bearing zone is being re-captured and subsequently treated by the LPH remediation system.

Metals, including aluminum, arsenic, iron, lead, manganese, selenium, and sodium are found throughout the bedrock water-bearing zone, with the highest concentrations again attributable to the interior portions of the site. However, as previously noted, the farthest down gradient wells closest to surface water, namely MW-6D, MW-21D and MW-25D, have concentrations of only arsenic (MW-25D, 8.7 ug/l) and manganese (MW-6D, MW-21D and MW-25D at 2240, 4250 and 3820 ug/l respectively) above surface water quality criteria. These concentrations are above human health criteria only and there are no exceedances of the aquatic criterion for arsenic, and manganese does not have an aquatic criterion. These constituents are not associated with historic operations, and may also be naturally occurring (manganese) or associated with anthropogenic fill (arsenic) on the Site.

Criterion No. 3

The bedrock aquifer does not discharge locally other than into the Arthur Kill, the ultimate point of discharge. The potential for impacts to the Arthur Kill is addressed by the assessment of the groundwater by comparison to surface water quality standards as described above. With the only discharge being to the Arthur Kill, there is no mechanism for a release of pollutants to the ground surface, structures, or air from the bedrock aquifer.

Criterion No. 4

Last, because the bedrock aquifer discharges to the Arthur Kill, the ultimate groundwater discharge point, there are no other down-gradient groundwater classification areas that could be impacted by the Site.

Specific comments (many need to be fixed throughout document):

1) ***Table ES-1. Remedy 5b should be" Full Containment and Full Depth…. "***

Agreed.

2) ***Page ES -2. Last paragraph, last sentence. Revise it to read "The anthropogenic fill found on the LCP Site and vicinity has been mapped as 'Historic Fill' by the NJDEP."***

As IES has indicated in the past, the sentence is factual as currently stated; however, this change will be made.

3) ***ES-3 first bullet. Place "(e.g., mercury)" between the words "contaminant," and "due"***

Agreed.

4) ***ES-3 Second bullet. Remove the phrase "…in particular visible mercury…"***

Agreed.

5) ***ES-3 Fourth bullet. Remove the word "visible."***

This sentence would not be correct if the word visible is removed. The 23,600 cubic yards is an estimate of the amount of soil containing visible elemental mercury, as further described in Section 2.7.1.2. This bullet will also be revised to be consistent with the discussion of principal threat waste in revised Sections 2.3.1 and 2.7.1.2 (see general comment regarding identifying visible elemental mercury as a principal threat waste), as follows:

> Because of the properties of elemental mercury (e.g., bioaccumulative, persistent), soils containing visible, elemental mercury are the focus of the preference under the Superfund Amendments and Reauthorization Act (SARA) for remedial actions that employ treatment technologies, and are considered in this FS to be principal threat waste. The estimated quantity of soil at the Site containing visible elemental mercury (principal threat waste) is 23,600 cubic yards.

6) ***ES-3 last bullet. Please remove the words "(naturally occurring)" and change the word "criteria" to "standard."***

Agreed.

7) ***ES-10 add a bullet for "State Acceptance" after "Cost."***

Nowhere in the FS is State acceptance currently discussed, so it is not clear how this bullet can be added. See the response to comment No. 8 for a possible approach to address this comment.

8) ***ES-10 first paragraph. Remove the word "and State" and modify the rest of the sentence into singular.***

Because State acceptance is not discussed in the FS, we suggest that the wording in this paragraph be changed to the following:

> In addition to the above seven criteria, State acceptance is an evaluation criterion that was addressed through coordination between the USEPA and the NJDEP, and Community acceptance is an evaluation criterion that is addressed through the public participation process.

9) ***ES-10 Remove the third bullet under "Protection of Human Health and the Environment" (i.e., the one that starts with "The only facility…").***

This bullet will be removed from this section and combined with the implementability discussion on page ES-13. The proposed revised text is as follows (see also comment No. 11):

> Site Remedy Nos. 5a and 5b require transport and disposal of visible elemental mercury wastes outside the United States. The only facility identified to accept visible elemental mercury impacted soil is the USEcology/Stablex facility in Canada. USEcology/Stablex has indicated uncertainty regarding the ability to provide the requisite disposal capacity. If visible elemental mercury remains following treatment at the USEcology/Stablex facility, it is sent for retorting, and then under the Mercury Export Ban Act, would have to be returned to the Site. In addition, the off-Site disposal of soil containing visible elemental mercury outside of the United States raises questions about the larger scale protectiveness of these two alternatives. These Site Remedies represent the potential displacement and not necessarily the proper treatment and disposal of soils containing visible elemental mercury. The USEcology/Stablex facility uses S/S technology which as discussed in Section 6, is not a proven technology for the treatment of visible elemental mercury. In effect, it is possible, that if the S/S process (which is proprietary and therefore limited information is available) were to potentially increase mercury mobility or the mobility of other constituents, the protectiveness of off-Site disposal would not be improved by comparison to the soils remaining on Site (i.e., containment would provide the control in both cases). In addition, even after removal of the portion of the contamination addressed by these alternatives, without the containment components of these remedies, the RAOs would not be met, ARARS would not be met, and potential incremental risks would remain above acceptable regulatory thresholds.

10) ***ES-11, second bullet, please define LDR.***

Agreed.

11) ***ES-11, second bullet under "Compliance with ARARs" should be revised to read. "Site Remedy Nos. 5a and 5b assumes waste will be shipped to the Stablex facility in Canada, therefore it would not violate LDRs for mercury as the regulations only apply within the United States. The Stablex process of S/S treatment and landfill disposal would not be permissible at a US facility without a variance to LDR requirements. " Also, please spell out Land Disposal Restrictions at least once.***

Agreed.

12) ***ES-12 last bullet, please remove everything starting with and after the phrase "The only disposal option…."***

The requested deletion will be made here but a portion of the wording will be integrated with the implementability discussion. See previous comment No. 9 for wording.

13) ***ES-12 – The evaluation criterion specifies the reduction of T,M or V only through treatment, not containment. Containment would also reduce mobility.***

Agreed. This will be clarified by adding the words "not through treatment as is the intent of this evaluation criterion" at the end of the first sentence in the first bullet.

14) ***Page ES-13, Short-Term Effectiveness, 2nd bullet: In the last sentence of this bullet, should "incremental" be "elemental"?***

Incremental is the intended word. The discussion is of increases in mercury vapor emissions over baseline conditions and the 7.7 pounds represents this increase or the incremental mercury vapor emissions for Alternative Nos. 2 and 3.

15) ***ES-14 please remove the last sentence under Cost. I.e., the one starting with "While these latter…"***

As discussed at a September 11, 2012 meeting, the portion of this sentence regarding the measureable benefits in protectiveness will be moved to the section on Long-Term Effectiveness, and the first part of this sentence will remain in this section. Specifically, the sentence "In addition, this conversion of elemental mercury to mercuric sulfide does not have any real measureable benefits in protectiveness" will be added to the second bullet under Long-Term Effectiveness. And, the sentence "Similar to Alternatives 4a and 4b, the removal of a portion of the contaminated soil does not have any real measureable benefits in protectiveness" will be added to the last bullet in the section on Long-Term Effectiveness.

16) ***Page 1-2, 4th bullet. Please add this sentence. "The technical memorandum effectively screened out all treatment and removal based alternatives, leaving only one action alternative (capping) for the soil remedy."***

The sentence as proposed in this comment is not entirely accurate as written, as it was not the intent of the technical memorandum to screen all of the alternatives, but rather to screen the treatment-based alternatives of solidification/stabilization and soil washing. The technology screening had retained a variety of alternatives including removal, and removal was not further evaluated in the August 2009 technical memorandum. The purpose of the memorandum was to advise the USEPA that IES believed neither of the treatment-based alternatives should be carried forward from the alternative screening process. We suggest that the wording recommended by USEPA be modified to read: "The technical memorandum effectively screened out all treatment-based alternatives."

17) ***Page 1-3, 5th bullet. Modify to: "Meeting with USEPA in January 2010 to discuss the August 2009 tech. memo at which EPA indicated that in order for all treatment technologies to be screened out, treatability studies would need to be performed to demonstrate impracticability. In accordance with Section….. IES agreed to prepare a treatability work plan."***

Agreed

18) ***Page 1-4, second paragraph last sentence. Please remove "…meets the definition of 'Historic Fill' contained in the New Jersey 'Technical Requirements for Site Remediation' (NJAC 7:26E-1.8) and…"***

See response to Comment No. 2.

19) ***Page 2-5, In Section 2.3.1, Nature and Extent of Contamination – Soils --- The FS should include a description of the free product identified in the soil borings. The Site Characterization Summary Report noted the presence of free product in Appendix A (under the column "Free Liquids - Organics").***

Section 2 of the FS is a summary of the RI. The RI discusses residual saturation (Section 6.1.8) and free phase liquids (Section 6.4.3). Free product as suggested in the Site Characterization Summary report, a precursor to the RI, was not encountered. The summary of the RI as presented in Section 2 of the FS will harmonized with the RI report when the RI is finalized, which is pending final resolution of comments with the Agency.

20) ***Page 2-6, 2nd paragraph and page 2-22, 1st full sentence: Arsenic at the site does not appear to be homogenous, as suggested. According to figures 6-2a and 6-2b, arsenic is concentrated around the northeast corner of the Linde Lease Hold Hydrogen Plant. Additionally, there does appear to be an otherwise decreasing gradient with depth. The data indicate that arsenic is could be site-related, although EPA recognizes that some arsenic may be a result of the anthropogenic fill.***

This comment relates to the RI, not the FS, because as noted previously, Section 2 of the FS is a summary of the findings of the RI. The summary of the RI as presented in Section 2 of the FS will be harmonized with the RI report when the RI is finalized.

21) ***Page 2-10.   First paragraph, remove all the text starting with the word "However,…" from the previous page.***

Agreed. However, the wording as stated is accurate.

22) ***Page 2-10.   The phase "…Surface Water Quality Criteria" should be "New Jersey Surface Water Quality Standards."***

Agreed.

23) ***Page 2-10 third paragraph, third sentence. Please delete the sentence that begins with "of the constituents that are representative…."***

Rather than delete this sentence, a suggested rewording is as follows: "Mercury, the principal site-related constituent, was found in only two wells above the Class IIA groundwater quality standards."

24) ***Page 2-11 first full paragraph, second to last sentence. Please revise to read "These constituents are most likely associated with the fill. "***

As written this sentence would not include the likelihood that manganese is also naturally occurring. Therefore, a suggested revision to address this comment is as follows: "These constituents are most likely associated with the fill or are naturally occurring (i.e., manganese)."

25) ***Page 2-13, third paragraph, second sentence revise to read: "These data, along with published information, were then used as a point of comparison."***

Agreed.

26) ***(p. 2-13) 2.3.4 Sediment; Appendix A – Table 6-18a; and Figure 2-12 - As per N.J.A.C. 7:26E-1.16 and NJDEP August 2011, low marsh soil data must be compared to sediment and/or soil ecological screening criteria (ESC) at http://www.nj.gov/dep/srp/guidance/ecoscreening. It is inappropriate to compare data from an environmentally sensitive natural resource, such as this wetland/wetland buffer zone, to the human health-based Non Residential Direct Contact Soil Remediation Standards (NRDCSRS). The text, table and figure referenced above should also be revised.***

These materials and this comment relate to the content of the RI. The summary of the RI as presented in Section 2 of the FS will be harmonized with the RI report when the RI is finalized. Of note, the low marsh soils data were also compared with the ER-L and ER-M sediment screening criteria, and along with the results of the Baseline Ecological Risk Assessment provide an appropriate basis for evaluating remediation of the low marsh soil.

27) ***Page 2-14, 1st paragraph, 1st sentence, "Arsenic concentrations in sediment and low marsh soil are elevated in the up-gradient area, but the elevated levels relative to those detected on site indicate that arsenic is present due to non-site sources (historic drainage along the railroad tracks from other sites)." According to Figure 6-2c, the elevated arsenic concentrations in tidal marsh deposits in the up-gradient portion of South Branch Creek are over 100 feet from the railroad tracks. As a result, it is unlikely that the arsenic in this area is a result of drainage from other sites along the railroad tracks. Additionally, we would expect to see similar arsenic contamination in other areas along the railroad tracks, which we do not. Samples collected in closer proximity to the tracks are mostly below the state background level for soils. Further, similar levels of arsenic were encountered near the northeast corner of the Linde Lease Hold Hydrogen Plant. Finally, biota samples which were speciated for arsenic indicate that more inorganic forms were present in the upgradient portion of South Branch Creek (transect A) and are likely site-related as opposed to samples collected closer to the Arthur Kill (more organic)***

which are likely more representative of regional background arsenic contamination. Arsenic should not be ruled out as a potential site contaminant.

This comment relates to the content of the RI. As previously noted, the summary of the RI as presented in Section 2 of the FS will be harmonized with the RI report when the RI is finalized.

28) ***(p. 2-14) 2.3.4 Sediment – The text states "Mercury concentrations within South Branch Creek attenuate with distance from the site and are comparable to regional Arthur Kill background by the confluence with the Arthur Kill." This statement should be removed .***

This comment relates to the content of the RI. As previously noted, the summary of the RI as presented in Section 2 of the FS will be harmonized with the RI report when the RI is finalized.

It is not clear whether the draft FS is suggesting that data from Transects F and G, proximal to the confluence of South Branch Creek and the Arthur Kill, represent "regional background" levels. The FS must consider data from these transects as site-related and not representative of regional background levels.

This comment relates to the content of the RI. As previously noted, the summary of the RI as presented in Section 2 of the FS will be harmonized with the RI report when the RI is finalized.

29) ***Page 2-15, Section 2.3.6: "Arsenic concentrations in tissue samples correlated with the location of elevated arsenic concentrations in sediment, and the tissue data for arsenic also indicated an unrelated off-site source other than the LCP Site (e.g., the unique form of arsenic found in a tissue sample upon speciation)." EPA interprets this data differently. It would appear that the elevated arsenic in tidal marsh soils correlates with the elevated arsenic in biota. The species of arsenic (more inorganic) in the biota of the up-gradient portion of South Branch Creek are different than the species (more organic) found close to the Arthur Kill. This suggests that the elevated arsenic concentrations are a result of site-related activities and the lower concentrations, nearer to the Arthur Kill are representative of regional background.***

This comment relates to the content of the RI. As previously noted, the summary of the RI as presented in Section 2 of the FS will be harmonized with the RI report when the RI is finalized.

30) ***Page 2-15, second 2.4. This is the first mention of COCs. Somewhere here or previous the COS should be listed.***

As noted in the general comment regarding COPCs, a new Section 2.6 will be added to the FS entitled "Summary of Contaminants of Potential Concern". A proposed draft of this section of the FS is attached for review (Attachment No. 2), along with a table summarizing the COPCs by medium and characterizing each as "site operations related" or not.

31) ***Page 2-17, 4th bullet, last sentence: "Arsenic, mercury, benzene, p-chloroaniline, and various metals were the primary contributors to the potential excess risk." According to Table 10.3***

RME in the Draft HHRA, the contaminants driving risk under the groundwater scenario are manganese, furan and p-choroaniline. Please rectify this discrepancy.

The description in the FS as stated is for the commercial/industrial worker scenario (Table 10.1 RME), not the construction/utility worker scenario (which is Table 10.3 RME). Reference should be made to Table 10.1 RME which shows that this exposure scenario presents the greater potential risk, and the associated constituents are as stated. There is no discrepancy.

32) Page 2-17, 6th bullet: Concentrations of lead in soil may cause adverse health effects to construction workers exposed to a mix of surface and subsurface soils, according to Page 6-6 of the Draft HHRA.

Section 6.4 of the *Final Human Health Risk Assessment*, issued in May 2011, indicates that for each potential exposure scenario for lead "…the Site is not expected to cause adverse health effects…."

33) Page 2-20, second paragraph. As mentioned previously, Class IIIB groundwater isn't regulated solely on impacts to surface water. This needs to be clarified, and text needs to be placed here and elsewhere discussing if the water meetings all Class IIIB regulations.

Please see the response to the general comment regarding the Class IIIB criteria. The paragraph on page 2-20 is focused on water quality, particularly as it relates to the adjacent LPH site, but will be clarified to indicate that the surface water quality comparison is just one criterion for a Class IIIB aquifer, and reference will be made to Section 2.3.3 for a detailed discussion.

34) Page 2-21, 1st full sentence: "Given the minimal ongoing stormwater discharge to South Branch Creek and the evidence that groundwater is a negligible source of mercury to surface water, the transport of mercury to South Branch Creek can be considered historic." I'm not sure this has been proven or even substantially supported by data, please delete.

Per discussion at a September 11, 2012 meeting, the word "mostly" will be inserted between "considered" and "historic".

35) Page 2-21, 2nd paragraph: "PCBs were generally low in South Branch Creek…" Please define "low". Were they below screening criteria? If so, which screening criteria?

In a letter dated October 11, 2012, Brown and Caldwell, on behalf of IES, provided a response to USEPA's comments on the draft RI report. One of the responses discusses the presence of PCBs in south Branch Creek. For consistency with the RI comments response, the following wording is proposed to address this comment: "The PCB results indicate that while there is the possibility of PCB contributions to South Branch Creek in the farthest upland transects, overall the PCB impacts are not significantly elevated beyond regional conditions present throughout the Newark Bay estuary."

36) Page 2-21. In the third paragraph, give the range of PCB concentrations in the SBC sediments.

Agreed. The range will be provided.

37) ***Page 2-22 – 1st bullet "containment" should be "contaminant."***

Agreed.

38) ***Page 2-25, second bullet. Explain what is meant by "surface volume."***

The terminology used is "volume surface" and it is a term of art from AutoCAD. It is defined in the second bullet on page 2-25 as the "…three dimensional surface that represents the contaminated soil thickness…." This paragraph will be clarified and simplified as follows:

> An automated feature in AutoCAD was then used to generate a "volume surface". Volume surface is a term of art in AutoCAD and simply represents the three dimensional volume represented between two limiting elevation surfaces. In this manner, the volume of anthropogenic fill (volume between the top of the fill and top of the tidal marsh deposits) and the volume of contaminated tidal marsh deposits and glacial till (volume between the top of the tidal marsh deposits and the maximum soil contamination depth surface) may be calculated.

39) ***Page 3-1 please rewrite the first paragraphs to contain the information below (or use it verbatim) and removed the subsequent 4 bullets.***
RAOs are media-specific goals to protect human health and the environment. Remedial alternatives are developed to meet the RAOs. The process of identifying the RAOs follows the identification of affected media and contaminant characteristics; evaluation of exposure pathways, contaminant migration pathways and exposure limits to receptors; and the evaluation of contaminant concentrations that would result in unacceptable exposure. The RAOs are based on regulatory requirements and risk based evaluations, which may apply to the various remedial activities being considered for the site.   This section of the FS reviews the affected media and contaminants that are required to be remediated and identifies federal, State and local regulations that may affect remedial actions.
PRGs were selected based on federal or State promulgated ARARs and risk based levels, with consideration also giving to background concentrations and other guidelines. These PRGs were used as a benchmark in the technology screening, alternative development and screening, and detailed evaluation of alternatives presented in the subsequent sections of this FS report.

Please see the response to comment No. 40, which integrates comment No. 39.

40) ***Page 3-1 In place of the first four bullets, please make a section called "identification of RAOS" in that section discuss all site related contaminants, media they were found it, relevant risk levels and which constituents the alternatives were focused on remediating (e.g., mercury). The section should be only a couple of paragraphs and should include the paragraph on 3-1 that begins with "Based on the above…" as well as the subsequent 4 bullets.***

As noted in the response to the first general comment, a new section 4.2 will be added to the FS which discusses PRGs. As such, the recommended language in comment No. 39 would reference this new section with respect to PRGs, and would account for minor changes in the suggested verbatim adoption of the language in comment No. 39. Attached for review is a proposed revision of Section 3.1 (Attachment No. 4), with edits shown in redline, which adopts the input from both comment Nos. 39 and 40.

41) ***Page 3-2, please delete the paragraph beginning with "When assessing…." as well as the subsequent 3 bullets***

Revisions related to this comment are incorporated in the proposed text as described in response to comment No. 40. The information in the three deleted bullets has been moved to the comparative analysis of alternatives, as applicable.

42) ***Page 5-2: Please include monomethyl mercury in the table of solubilities.***

Monomethyl mercury is ionic and for all intents and purposes does not exist in solution (for example, see "Water Quality Criteria for the Protection of Human Health: Methylmercury, EPA-823-R-01-001, January 2001). Methyl mercuric chloride is a common, soluble form of methylmercury, and its solubility is provided in the table.

43) ***Page 5-9. Third bullet, remove sentence referencing Brookhaven Lab.***

As discussed at a September 11, 2012 meeting, rather than delete this sentence, its relevance will be further expanded, as proposed in the excerpt below.

> …The solubility of mercury is affected by pH as well as conversion of mercuric sulfide to other more soluble species (e.g., mercuric oxide) during the S/S process. Various researchers have evaluated S/S options for mercury stabilization that does not result in creation of more mobile compunds or remobilization of mercury. The patented Brookhaven National Laboratories (BNL) mercury treatment process of S/S with sulfur polymer cement (actually closer to stabilization followed by microencapsulation) is an example of these evaluations, and the process has shown the ability to stabilize elemental mercury without increases in solubilization or remobilization. This process, however, ~~but~~ is not currently a commercially available technology, nor have any others been identified that have the same level of success with conversion and stability.

44) ***Page 6-3. First paragraph, last sentence. I believe the discount rate is 7%, please confirm.***

The USEPA "Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002, July 2000) specifies a discount rate of 7%. The 5% discount rate used in the FS is a slightly more conservative value, however, for consistency with the guidance, the 7% rate will be used and appropriately referenced. This change will not have a material effect on the cost analysis.

45) ***Page 6-4, Section 6.1.2, Alternative No. 2S, discusses the conceptual capping system, however there is little detail about the proposed cap. The first paragraph notes that "for the purpose of evaluating this alternative, a soil cap, including 24 inches of certified clean fill, along with geosynthetic membrane and drainage components, has been assumed since it would be representative of the various capping options." Section 6.1.7, Alternative 6S, discusses the treatment component of the conceptual cap. The concept behind the treatment component of the cap is that elemental mercury could react with a sulfur-based compound, resulting in the formation of cinnabar (i.e., mercuric sulfide) to some degree, dependent on a variety of conditions. The FS proposes that by including a sulfur-based component in the soil cap, some treatment of mercury vapor could result, and would further limit mercury vapor pathway and the potential for mercury vapor buildup below the cap. While the FS notes that pilot studies would be necessary for soil treatment and stabilization, there is no mention of the need for pilot studies for the Treatment Cap. If the Treatment Cap is selected, then a treatability or pilot study will be necessary. Also, any other available case studies using this technology should be provided in the FS.***

The treatment cap is an innovative approach conceived for this site. No case studies of this application of the technology have been found. If a treatment cap is selected as a remedy component, the decision regarding a pilot study would presumably be made as a part of the remedial design work plan. Mention is not made of a pilot study for the treatment cap because IES does not believe that such a study would be meaningful. The treatment cap concept is intended as a secondary method (membrane being the primary method) of controlling potential mercury vapor. Since mercury vapor migrating toward the treatment cap will vary based on visible mercury presence, mercury concentrations, proximity to the ground surface, and ground temperature, it is unlikely that a pilot study would provide predictions about vapor conversion that would be useful for design. Of note, the building ambient air monitoring that IES has been performing at the site has generally shown the absence of mercury vapor (i.e., non-detectable) or presence of mercury vapor at very low levels (i.e., well below screening criteria). Conversely, the stabilization remedy is intended to actively manipulate soils to convert elemental mercury to mercuric sulfide. Pilot studies in this case would be useful in determining factors such as the degree to which differences in the excess sulfur dose and mixing times affect conversion. For these reasons, pilot studies of the treatment cap are not recommended, and no change to the wording is proposed.

46) ***Page 6-27, 1st paragraph: "Upgradient of the Arthur Kill, the distribution of groundwater quality impacts is indicative of impacts associated with the adjacent LPH site and is not associated with LCP." Please temper a bit, perhaps replace the "is" after the word "and" with the phrase "…and does not appear to be associated…."***

Since the groundwater quality and head data rather clearly show that this statement is accurate, tempering this too much may give the erroneous impression that contaminant distribution at the LCP site is not as well understood, as it actually is. The proposed wording, therefore, is as follows: "Upgradient of the Arthur Kill, the distribution of groundwater quality impacts is indicative of impacts associated with the adjacent LPH site rather than indicative of impacts from the LCP site."

47) ***Pages 6-41 and 6-43; the discussions on eliminating S/S. EPA feels solidification could work if the correct solidification agents were selected in a pilot study. EPA feels this should be retained.***

The rationale for eliminating S/S but retaining stabilization is not based on the fact that a solidification agent could not possibly work. Rather, the elimination of this alternative is based on two combined factors. The first is that commercially available methods and materials (e.g., addition of pozzolanic materials) have indicated a potential to increase mercury mobility, which would defeat the purpose of the stabilization portion of the process. The second is that to the extent a combined S/S technology has demonstrated the ability to limit mercury leaching, for instance the BNL patented sulfur polymer cement process (although this process is closer to encapsulation), these processes have not been demonstrated full scale, and are not currently commercially available. For these reasons IES believes that S/S has been appropriately eliminated from further consideration.

48) ***Page 6-43 – Title of 6.7.4 should be Alt 9S-1 and 9S-2 for soil washing.***

Agreed.

49) ***(p. 7-6) 1st bullet – The FS proposes to excavate sediments to 2.5 feet deep in the lower portion of South Branch Creek, 1 foot in the low marsh soils, and 2.2 feet in the Northern Offsite Ditch. The basis for these depths and the lateral extent in wetland soil is not stated and it is unclear whether contamination extends beyond these limits, e.g., vertically into the bed material. Pursuant to N.J.A.C. 7:26-4.1, contaminants must be delineated to the ESC. The horizontal and vertical extent of the remediation should be based on achievement of the PRGs. In lieu of site-specific ecological risk-based remediation goals, as per NJDEP August 2011, the higher of background or the ESC shall be used as remediation goals. Additionally, pursuant to N.J.A.C. 7:26E-5.1(e), if free and/or residual product is present, it must be treated or removed. Pursuant to N.J.A.C.7:26E-5.5, compliance with the ecological risk-based remediation goal must be demonstrated via post excavation sampling and analyses.***

Without establishing clear numeric remediation goals, it is unclear whether contaminants are adequately delineated and whether the proposed sediment/soil excavation is protective of ecological receptors. For example, if contaminants will remain above PRGs/RMDs or the ESC, clean backfill may be needed in excavated areas of the lower portion of South Branch Creek and Northern Offsite Ditch in order to prevent contaminant exposure to ecological receptors.

If contamination above the selected clean up goals will remain, this must be identified and addressed. A figure that indicates any locations and elevated contaminant levels that will remain outside of the remedial footprint should be included with the revised FS.

The FS does state the basis for the limits of sediment removal as corresponding to "…the maximum depth of the sediment layer as defined during the RI activities…." That is, the assumption is that the entire sediment layer will be removed. As such following the sediments remediation, there would not be any sediment from which to collect a sample for comparison to sediment PRGs. In addition, as described in the RI, low marsh soils are the surficial "…soils within and/or immediately adjacent to the narrow band of tidal wetland along South Branch Creek." Low marsh soils were sampled to a depth of six inches whereas the FS assumes that low marsh soils will be removed“ to a depth of approximately one foot.” Again, the presumption in the FS is that the entire layer of contaminated low marsh soils would be removed. The FS also indicates that restoration will occur following the sediments and low marsh soil remediation. Immediately adjacent to the creek remediation/restoration area is the LCP Site (which includes a soil remediation component), Nu Star Energy tank farms, or the Linden Roselle Sewage Authority.

50) ***Page 7-24 Third bullet, the upper temperature limit seems low. Surface temperatures of the site soil can reach 100 degrees F during the summer months.***

While it is unlikely that surface soil (i.e., soils to a depth of 6 inches) temperatures would be maintained at 100 degrees Fahrenheit, a 40 degrees Centigrade line will be added to the chart.

51) ***Page 7-28, Section 7.5. – The detailed evaluation in this section should be performed in detail based on each evaluation criterion and also sub-criteria for all the alternatives. This section should follow that requirement.***

Section 7.5 does address each of the evaluation criteria. However, sub-headings will be added to clarify the analysis and to the extent practicable wording will be edited to clearly indicate how the evaluation criteria are addressed.

52) ***Page 7-30 – Second paragraph (“approximately 57 pounds)” The report has not indicated how many total pounds of mercury are on the site. Please provide the number.***

As described in the RI, soil samples that contained visible elemental mercury were not submitted for laboratory analysis, with few exceptions. Consequently, a site-wide estimate of the total mass of mercury is not presented as there is no analytical data upon which to base an estimate.

53) ***Page 7-31 – Third paragraph. “The soil components have an unlimited lifespan.” This should read “soil cap components.” Also a soil cap would be subject to erosion and tree growth if not maintained. In other words, a long term maintenance program would be required.***

The wording will be changed to “soil cap components.” The first sentence of this paragraph states “The remedy would be effective in the long term with proper maintenance of the soil cap.”

54) ***Page 7-40 Second para beginning with “However, given that…” EPA does not agree with this statement. Even though containment would be the first line of defense, treatment or off-site disposal would provide a second line of defense should the containment cell fail.***

As discussed at a September 11, 2012 meeting, this sentence will be moved to the comparative discussion of effectiveness in Section 7.6 of the FS. Key to the statement made in the FS is that it questions the value of “…***removal of a portion*** [emphasis added] of the wastes….” As described in the RI and the FS, the site contains a number of constituents throughout the property, whether from prior site operations, off-site sources, or the anthropogenic fill, above PRGs and risk thresholds. As such, complete restoration is not practicable, and materials will remain that if not properly contained could pose potentially unacceptable risks. If containment were to fail with or without the partial removal, potentially unacceptable risks could result, and as such this would be a reasonable element of a comparative analysis of the alternatives.

55) ***Page 7-42 – 4th bullet, Alt 4 and Alt 5 are more protective, long term than Alt 3 which is more protective than Alt 2.***

As indicated in the FS, we believe that since each of these alternatives meets the RAOs they are generally equally protective. The FS did acknowledge that Alternatives 4 and 5 add treatment and removal components, but did not go so far as to indicate that this alters the hierarchy of effectiveness because of the issue noted in the response to comment No. 54. To the extent that a treatment or removal component does not eliminate a risk pathway (and neither does), then each of the alternatives ultimately relies upon containment for protectiveness and the containment components are equally protective for each alternative. For these reasons we do not recommend a change in the language in the FS. We believe the language as written provides the USEPA with the ability to distinguish among the alternatives on a factual basis.

56) ***Page 7-43, Reduction of T/M/V. The report should note that Alts 2 and 3 do not reduce TMV through treatment, while Alts 4 and 5 would.***

The proposed edits to the first bullet under Reduction of Toxicity, Mobility, or Volume are as follows:

> In general, with the exception of Site Remedy No. 1, the Site Remedies reduce the mobility of contaminants at the LCP site. Site Remedy Nos. 2 and 3 reduce mobility through containment, not through treatment which is the focus of this evaluation criterion. Site Remedy No. 2 potentially reduces mobility marginally less than Site Remedy No. 3 ~~the other Site Remedies~~ because it does not include a barrier wall component, which further limits the potential for lateral migration of contaminants. However, this difference is not substantial. Site Remedy No. 4 reduces mobility through treatment as discussed further below. Site Remedy No. 5 reduces the volume of material on site through removal and subsequent treatment at an off-site facility, as also discussed further below.

57) ***Table 5-2. Mercuric Sulfide is not insoluble. I has a very low solubility in crystalline form, however when it first forms it probably exists in an amorphous compound, that crystallizes over time. In other words, metal sulfides formed in-situ are typically more soluble and less stable (e.g., subject to oxidation). The Ksp value for mercuric sulfide should be provided (rather than "insoluble") with a footnote indicating that the value is for the crystalline form.***

Of note, the Handbook of Chemistry and Physics lists mercuric sulfide as insoluble. And, for all intents and purposes it is. Various researchers report the K_{sp} of mercuric sulfide in the range of 10^{-32} to 10^{-53}. Converting this to a solubility results in concentrations ranging from 2.3×10^{-11} to 7.3×10^{-22} mg/L, effectively insoluble. For consistency with the other solubilities shown on page 5-2, this range will be provided with a footnote that it is for the crystalline form.

58) ***Figure 2-5: Please indicate the depth at which visible mercury was present in soil samples.***

Depth intervals will be added to the figure. Note that the maximum depth interval in the areas of the site where mercury is visible is shown on Figure 7-4 and in Appendix B.

59) ***Figure 7-4 should be in color.***

Figure 7-4 is in color.

ATTACHMENT NO. 1

REVISED SECTION 4.0 AND NEW TABLE 4-2

REVISED SECTION 4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND PRELIMINARY REMEDIATION GOALS

4.1 Applicable or Relevant and Appropriate Requirements

This section outlines Federal and/or State environmental regulations and laws which can be used for evaluation of the proposed remedial alternatives for the LCP site. Such requirements are typically referred to as applicable or relevant and appropriate requirements (ARARs). The ARARs may be applicable to the constituent(s) of interest, location of the remedial action, or the type of remedial action. Both Federal and State environmental regulations and laws are considered. The Federal and State ARARs presented in this section are then used subsequently for screening and evaluating remedial alternatives, the permitting requirements for the alternatives, and whether there may be means to expedite permitting for the alternatives.

"Applicable" requirements are standards and requirements promulgated under Federal and/or State environmental laws that specifically address a constituent of concern, remedial action or location of a site.

"Relevant and Appropriate" requirements are standards and requirements promulgated under Federal and/or State environmental laws that, while not directly applicable, may be suitable to address a constituent of concern, remedial action or location of a site.

"To be Considered" (TBC) requirements are local ordinances, unpromulgated criteria, advisories, or guidance that do not meet the definition of ARARs but that may assist in the development of remedial objectives or cleanup criteria, or evaluation of alternatives, particularly where ARARs may not address all relevant site risks.

ARARs fall into three general categories, which are determined on the basis of how they are applied at a site. These categories are as follows:

- Chemical-specific: These ARARs typically define concentration-based limits for specific constituents in an environmental medium. An example of a chemical-specific ARAR is a groundwater quality standard.
- Location-specific: These ARARs set restrictions on remedial activities at a site due to its proximity to specific natural or man-made features. An example of a location-specific ARAR would be wetlands regulations, assuming a portion of a remedial action were performed in a regulated wetland.

- Action-specific: These ARARs set controls and restrictions on the remedial action to be used at the site. Each remedial action will be governed by appropriate action-specific ARARs that will specify performance standards for the remedial action. A NJPDES permit for discharge to surface water is an example of an action-specific ARAR, which would apply to an action such as discharge of groundwater to the Arthur Kill following ex-situ treatment.

The chemical, location, and action-specific ARARs potentially applicable to the LCP Site are presented in Table 4-1. TBCs that may be potentially applicable are also noted in Table 4-1. While the remedial alternatives for the site are to be developed to meet the remedial action objectives presented in Section 3.1, and as such pertain specifically to addressing contamination found at the LCP Site, implementation of a remedial alternative may have other environmental or permitting considerations. Therefore, the ARARs represent a range of regulatory jurisdiction pertaining to the following broad categories: air, groundwater, sediment, surface water, soil, wetlands and coastal zones, hazardous waste, and fish and wildlife. Compliance with ARARs is part of the evaluation criteria used in the screening process for the detailed analysis of the remedial alternatives presented in Section 7.

4.2 Preliminary Remediation Goals

For each of the contaminants of potential concern (COPCs) identified in Section 2.6, Preliminary Remediation Goals (PRGs) have been established, and are summarized in Table 4-2. These PRGs are based on Federal and State regulations and guidance. More specifically, PRGs by medium have been established as described below.

Groundwater

Both Federal and State chemical-specific ARARs have been identified for groundwater, as discussed previously in Section 4.1. New Jersey groundwater quality standards are considered to be applicable to the remediation of groundwater contamination at the LCP Site. Specifically, the New Jersey chemical-specific Class IIA groundwater quality standards apply to the overburden groundwater. Federal and State primary drinking water standards (maximum contaminant levels [MCLs]) are considered to be relevant and appropriate for consideration in the remediation of the overburden groundwater since the overburden groundwater is classified as IIA (this classification includes potable use even though the overburden groundwater could not be used for potable purposes). Similarly, the USEPA Regional Screening Levels (RSLs) for tap water are “to be considered” criteria based on the overburden groundwater classification. The PRGs for groundwater, as shown in Table 4-2, are set at the New Jersey Groundwater Quality Standards. The MCLs or RSLs would apply if a COPC did not have an applicable New Jersey Groundwater Quality Standard.

The bedrock groundwater has been reclassified as IIIB, saline, and therefore, neither Class IIA standards nor MCLs would apply. Published numerical water quality standards are not available for Class IIIB aquifers, and a means to develop numeric standards has not yet been developed by the NJDEP. In addition, as discussed in detail in Section 2.3.3, the distribution of groundwater quality impacts (illustrated by chlorobenzene and soluble mercury) is indicative of impacts associated with the adjacent LPH site and is not associated with LCP. The impacted groundwater from the adjacent LPH site is captured by a groundwater extraction system. To the extent there is a divide in the bedrock potentiometric surface on the LCP Site and bedrock groundwater discharges to the adjacent Arthur Kill, down-gradient bedrock water quality can be compared to surface water quality standards (N.J.A.C. 7:9B) to assess the potential for impact, although the surface water quality standards are not groundwater PRGs per se. As noted in Section 2.3.3, the farthest down gradient wells closest to surface water, namely MW-6D, MW-21D and MW-25D, have concentrations of only arsenic (MW-25D, 8.7 ug/l) and manganese (MW-6D, MW-21D and MW-25D at 2240, 4250 and 3820 ug/l respectively) above surface water quality standards. These concentrations are above human health standards only and there are no exceedances of the aquatic standards for arsenic, and manganese does not have an aquatic standard. These constituents are not associated with historic operations, and may also be naturally occurring (manganese) or associated with anthropogenic fill on the Site or off-site sources (arsenic).

Soils

The only applicable ARAR for soils is the NJDEP Soil Remediation Standards (N.J.A.C.7:26D). The NJ standards provide chemical-specific ARARs for direct contact exposure scenarios for soils at the site. The relevant standards are the non-residential direct contact standards, as the site is an industrial use and is zoned accordingly. These standards are summarized in Table 4-2. The USEPA RSLs also provide guidance values for Industrial Soil, and are also shown on Table 4-2. The NJ regulations provide alternatives for calculating impact to groundwater standards as well as default guidance values based on use of the soil-water partition equation. The default guidance values are shown in Table 4-2. In addition, the USEPA RSLs for Protection of Groundwater ("to be considered" criteria) have been included as additional information.

The impact to groundwater guidance values are largely irrelevant given that anthropogenic fill has been placed at the site and by default in New Jersey a Classification Exception Area (CEA) for Groundwater is established for an indeterminate period of time for a historic fill site as a part of the presumptive remedy. In addition, groundwater has been separately evaluated by comparison to groundwater quality standards as well as in the risk assessment. Consequently, the impact to groundwater soil standards are provided for information, but are not used in selecting PRGs. The PRGs are based on the NJDEP non-residential standards, or where a standard does not exist, the industrial soil RSLs have been selected.

Sediments

For the purpose of this FS, sediments include both surficial sediments in South Branch Creek and the Northern Ditch, as well as low marsh soils around South Branch Creek to the extent not otherwise controlled by a soils remedial component. Applicable ARARs for sediments do not exist. Rather, the only available sediments criteria which can be applied to generate PRGs are the NJDEP Ecological Screening Criteria, and in particular, the Effects Range – Low (ER-L) and Effects Range – Median (ER-M) values. The relevant numeric criteria are for saline waters, and are shown in Table 4-2. The NJDEP criteria are for screening purposes, and if necessary, further pre-design delineation and development of site-specific criteria may be in order to guide remediation.

Surface Water

PRGs for surface water are not presented in Table 4-2, and have not been developed for the LCP Site. As previously described in Section 2.6 for the Site COPCs, contaminants are not present in surface water, or if present are found principally as a consequence of the presence of sediment in the water column. As a result, there is not a site-specific need for PRGs for surface water.

TABLE 4-2
PRELIMINARY REMEDIATION GOALS

COPC	SOIL					GROUNDWATER (CLASS IIA)				SEDIMENT		
	EPA RSL INDUSTRIAL	NJDEP NON-RESIDENTIAL REM. STD	EPA RSL, RISK-BASED PROTECTION OF GROUNDWAER	NJDEP IMPACT TO GROUNDWATER, DEFAULT	PRG[3]	EPA RSL TAPWATER	CWA MCL	NJDEP GW STD	PRG	ER-L	ER-M	PRG[4]
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/L	µg/L	µg/L	µg/L	mg/kg	mg/kg	mg/kg
Arsenic	1.6E+00	1.9E+01	1.3E-03	1.9E+01	19	4.5E-02	1.0E+01	3.0E+00	3	8.2E+00	7.0E+01	8.2
Barium										-	4.8E+01	48
Chromium										8.1E+01	3.7E+02	81
Copper										3.4E+01	2.7E+02	34
Iron										-	-	-
Lead										4.7E+01	2.2E+02	47
Manganese										-	2.6E+02	260
Mercury[1]	4.3E+01	6.5E+01	3.3E-02	1.0E-01	65	6.3E-01	2.0E+00	2.0E+00	2	1.5E-01	7.1E-01	0.15
Vanadium										-	5.7E+01	57
Zinc										1.5E+02	4.1E+02	150
PCBs[2]	7.4E-01	1.0E+00	2.4E-02	2.0E-01	1					5.0E-03	2.4E+01	0.005
PCDDs										-	-	-
PCDFs	1.0E+03	-	1.1E-01	-	1000	5.8E+00	-	-	5.8	-	-	-
PAHs - Benzo(a)pyrene TEQ	2.1E-01	2.0E-01	3.5E-03	2.0E-01	0.21							
Benzene						3.9E-01	5.0E+00	1.0E+00	1			
Chlorobenzene						7.2E+01	1.0E+02	5.0E+01	50			
Chloroaniline, p-						3.2E-01	-	3.0E+01	30			
Dichlorobenzene, 1,4-						4.2E-01	7.5E+01	7.5E+01	75			
Trichlorobenzene, 1,2,4-						9.9E-01	7.0E+01	9.0E+00	9			
Hexachlorobenzene	1.1E+00	1.0E+00	5.3E-04	2.0E-01	1.1							

Notes:
1. Elemental Mercury used for PRG selection
2. Criteria based on Aroclor 1260
3. Based on non-residential regulatory standard or if no standard then industrial guidance value. IGW values provided for information only. Groundwater evaluated separately.
4. ER-L used for PRG, pre-design delineation necessary. ER-M used if no ER-L.
5. "-" indicates no criteria or standard
6. Shading indicates constituent is not a COPC for given medium

ATTACHMENT NO. 2

NEW SECTION 2.6 AND TABLE 2-4

New Section 2.6 Summary of Contaminants of Potential Concern

The preceding sections summarize the distribution, fate, transport, and baseline risk assessment for the various contaminants found at the site related to site operations, adjacent properties/operations, and the anthropogenic fill. As noted in the preceding sections, a number of contaminants are present at the site above comparative standards (e.g., NJ Non-Residential Soil Remediation Standards) or guidance levels (e.g., sediment ER-Ls). Each of the contaminants above such comparative standards would be considered a contaminant of potential concern (COPC). In addition, the Human Health and Ecological Risk Assessments provide information for identifying COPCs, as follows:

- With a human health cancer risk greater than 1E-6, or a key contributor to risk;
- With a human health non-cancer hazard quotient greater than 1, or a key contributor to risk; and
- Ecological hazard quotients greater than 1, unless mitigating circumstances eliminated a constituent (e.g., naturally occurring, mean concentration below cleanup level based on most sensitive end point).

Table 2-4 presents a list of the COPCs derived on the above basis. Of note, the sediments COPCs correspond to the list generated in conjunction with the USEPA during the Baseline Ecological Risk Assessment Problem Formulation, and includes the naturally occurring element of iron that is not considered a risk driver, but that the USEPA requested be retained for the ecological risk assessment.

As described in Section 2.3.5, generally COPCs are not present in surface water, or if present are found principally as a consequence of the presence of sediment in the water column. Therefore, surface water COPCs are not included in the COPC list in Table 2-4.

TABLE 2-4

Chemicals of Potential Concern (COPCs)

MEDIUM	COPC	SITE OPERATIONS RELATED		Basis
		YES	NO	
Soil	Arsenic		x	A, B
	Mercury	x		A, B
	PCBs	x		A,B
	PCDFs	x		A,B
	PAHs - Benzo(a)pyrene TEQ		x	A,B
	Hexachlorobenzene	x		A,B
Groundwater	Arsenic		x	A,B
	Mercury	x		A,B
	PCDFs	x		A,B
	Chloroaniline, p-		x	A
	Dichlorobenzene, 1,4-		x	A
	Trichlorobenzene		x	A
	Benzene		x	A
	Chlorobenzene		x	A
Sediment	Arsenic		x	B
	Barium		x	B
	Chromium		x	B
	Copper		x	B
	Iron		x	C
	Lead		x	B
	Manganese		x	B
	Mercury	x		B
	Vanadium		x	B
	Zinc		x	B
	PCBs	x		B
	PCDDs		x	B
	PCDFs	x		B

Basis Key:

A - Human Health Risk

B - Ecological Risk

C - BERA Problem Formulation with USEPA

ATTACHMENT NO. 3

PRINCIPAL THREAT WASTE REVISIONS TO SECTION 2.3.1 AND 2.7.1.2

2.3 Nature and Extent of Contamination

2.3.1 Soils

As previously described, the Site is covered by a layer of fill material (anthropogenic fill) which overlies naturally occurring tidal marsh deposits and glacial till, which deposits overlie bedrock. Constituent concentrations within anthropogenic fill, tidal marsh deposits and glacial till have been compared to the New Jersey Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS). The NRDCSRS are promulgated remediation standards (N.J.A.C. 7:26D) that are based on theoretical exposures via accidental human ingestion, dermal contact, and/or inhalation of soils. The NRDCSRS represent concentrations below which NJDEP would not have concern about incidental human exposure under a non-residential scenario. Given the nature and character of the LCP Site and surrounding area, use of non-residential criteria is considered appropriate.

The anthropogenic fill is continuous across the Site with an average thickness of approximately 9 feet. The fill consists of an irregular mixture that is primarily comprised of soil but is characterized by the frequent presence of anthropogenic materials, including ash, wood fragments, bricks, and glass. Various constituents, including arsenic, mercury, PCBs, PAHs and to a lesser extent lead and hexachlorobenzene are found frequently throughout the fill material at concentrations above the NRDCSRS. Other constituents, including cadmium, cobalt, and occasional VOCs and SVOCs, are also present above the NRDCSRS, although their presence is not as widespread as the constituents identified above.

Mercury was measured in the surficial fill from non-detect to 7,870 mg/kg, with more than half of the detections above the NRDCSRS. However, mercury concentrations were attenuated with depth, as for example, only 5 of 28 samples tested in the marine tidal marsh deposits had mercury concentrations above the NRDCSRS. The presence of mercury in soils is related to the former manufacturing operations at the site. PCBs were also detected in the former production area, and while not directly related to chlor-alkali production, may have been related to the electrical equipment associated with the production. Other constituents which can be associated with chlor-alkali production include polychlorinated dibenzo-p-furans (PCDF), polychlorinated naphthalenes, and hexachlorobenzene. Toxic Equivalency Factors (TEFs) are assigned to PCDFs (and PCDDs – polychlorinated dibenzo-p-dioxins) relative to the toxicity of 2,3,7.8-PCDD. The TEFs are used to develop a Toxicity Equivalency Quotient (TEQ) which is the sum of the quantity of each individual PCDF/PCDD's respective TEF. TEQs allow the comparison of the relative risk of exposure in areas of contamination that vary widely in the composition and level of these compounds. TEQ values were calculated for PCDF/PCDD, however all the TEQs were less than 1.0 µg/kg (ppb), ranging from 0.00002 to 0.885 µg/kg. Similarly, the class of compounds identified as Polychlorinated Naphthalenes (PCNs) are considered to be "dioxin like" and the more toxicologically significant higher chlorinated congeners have been associated with other chlor-alkali sites. However, these higher chlorinated congeners have not been detected at the LCP Site. The total PCN concentrations for the lower chlorinated congeners ranged from 0.007 mg/kg to 76.8 mg/kg in the surficial fill and 0.012 mg/kg to 19.2 mg/kg in the deep fill. Although low levels of PCNs were also detected in several tidal marsh deposits and glacial till samples, the concentrations were considerably lower than detected in shallower soils. Hexachlorobenzene was detected in surficial soils above the NRDCSRS, principally in areas of former production and appears to be related to the former chlor-alkali production. In general, the various compounds which can be associated with chlor-alkali production or may have otherwise been associated with site operations (e.g., PCBs from electrical equipment) are co-located with mercury.

Arsenic and PAHs were detected above the NRDCSRS throughout the full thickness of the fill material with no apparent decreasing concentration gradient with depth. This is consistent with the known presence of these constituents in historic/anthropogenic fill material (NJAC 7:26E, Appendix D). For instance, Figures 6-2a through 6-2d in the RI (included in Appendix A for reference) show arsenic distribution throughout the LCP property, and the locations where arsenic is found above the NRDCSRS have no relationship to the operations at the LCP Site. A review of Figures 6-5a through 6-5d for PAHs shows similar conditions to arsenic – no pattern or distribution associated with past Site operations. The remaining constituents were typically found most frequently and at higher concentrations in the shallow fill material and less frequently and at lower concentrations with depth. A summary table of constituent concentrations exceeding the NRDCSRS in the fill is presented in RI Tables 6-2a and 6-2b, attached in Appendix A.

Marine tidal marsh deposits underlay the anthropogenic fill throughout the entire Site at an approximate thickness between 5 to 10.5 feet. Below the tidal marsh deposits are glacial till deposits throughout the entire Site at an approximate thickness between 18.5 and 20.5 feet. Concentrations of constituents above the NRDCSRS in the underlying tidal marsh and glacial till deposits are provided in RI Tables 6-2c and 6-2d, attached in Appendix A. As indicated by these tables, the number of constituents and sample locations where concentrations of constituents are found above the NRDCSRS is considerably less than that within the fill.

A composite map illustrating the boring locations within Site overburden materials (i.e., fill, tidal marsh deposits, and glacial till) at which one or more constituents exceeded the NRDCSRS is provided in Figure 2-5, which indicates concentrations of various constituents above the NRDCSRS are widely distributed across the entire Site with no discernable distribution pattern. This is not to say that past Site operations did not have an influence on the nature and extent of contamination in soils, as previously noted. For instance, as described above, mercury is found most frequently and at the highest concentrations (sometimes visible mercury) in soils around and beneath the former mercury cell buildings. Rather, Figure 2-5 helps to illustrate that two circumstances have been contributors to the nature and extent of contamination at the Site. One is the anthropogenic fill which represents a heterogeneous and site-wide source of contamination. The other is the on-Site operations, which have resulted in contamination correlated to prior site activities, most notably mercury in and around the former cell buildings, and manifested in the sediments in South Branch Creek.

Visible elemental mercury was reported at 31 sample locations within the vicinity of the former production area, which are presented in RI Table 6-3, attached in Appendix A. In addition, mercury has been observed at the ground surface in apparent response to rainfall events, likely as a result of capillary action as soil pores become saturated with water and the surface tension exhibited by mercury (i.e., mercury has a greater affinity for itself than as a wetting fluid for the soil). Evidence of mercury on the ground surface, coupled with the knowledge that the frequency of visible elemental mercury and the concentration of total mercury within the analytical samples decreases with depth, suggests that downward migration of elemental mercury as a result of its density is not a significant factor at the LCP Site. However, visible mercury was reported in two of the glacial till samples collected from horizontal borings beneath Building 240. These findings suggest that elemental mercury may sporadically migrate downward along vertical features such as building piles. Locations at which elemental mercury was observed either in soil borings or observed on the ground surface are illustrated in Figure 2-5, referenced above. As shown in Figure 2-5, observations of visible elemental mercury occur around the former cell buildings, and are also co-located with exceedances of NRDCSRS for various other constituents.

For the purpose of this FS, visible elemental mercury in soil is considered here to be principal threat waste. Principal threat wastes are generally defined as wastes such as drummed liquids or NAPLs, mobile source materials (e.g., high concentrations of soluble contaminants) or highly toxic source materials (e.g., buried wastes or soils with "significant" (USEPA, 1991) concentrations of highly toxic materials). Mercury is considered a persistent, bioaccumulative, and toxic substance which does not readily degrade in the environment. As described in Section 2.3.3, elemental mercury at the site, including visible elemental mercury, has not been found to be mobile at the Site. The visible elemental mercury does represent a potential continuing source at "significant" concentrations in soil, represents a source to the potential direct contact and vapor exposure pathways, and as discussed in Section 2.5 is a principal contributor to potential site risks. However, for the purpose of this FS, complete exposure pathways do not exist at depth thereby mitigating visible elemental mercury as a principal threat waste. The volume of soil containing visible elemental mercury is further discussed in Section 2.7.

Mercury speciation testing was conducted on six selected surficial soil samples to determine the relative mobility of mercury found at the Site (Results of mercury speciation testing are presented in RI Table 6-5, attached in Appendix A). Results of this testing indicate that the mercury present in the surficial soils is primarily in low solubility/insoluble forms including elemental (metallic) mercury and mercuric sulfide (metacinnabar). The occurrence of these low solubility/insoluble mercury species indicates that mercury in the Site soils is relatively immobile, and principally present in stable forms. The low mobility of the mercury in the Site soils is evidenced by the relative absence of mercury in overburden groundwater. Despite the widespread presence of mercury in overburden soils, including visible mercury at 31 locations as noted above, only two wells, MW-23S and MW-24S, had dissolved concentrations of mercury above the NJ groundwater quality standard of 2 ug/L.

The RI also looked at various classes of compounds for comparison against other criteria, as applicable. Individual constituents identified as PCBs and PAHs are addressed by the NRDCSRS. Carcinogenic PAHs (cPAHs) consist of eight specific, high-molecular weight PAHs that are designated by USEPA as possible human carcinogens. Benzo(a)pyrene (B(a)P) is the most completely studied of the possibly carcinogenic PAHs and exhibits the highest relative toxicity. TEQ values for the cPAHs ranged from non-detectable to 102 mg/kg and the detectable concentrations are widely distributed across the entire Site with no discernable distribution pattern, and most likely are associated with the anthropogenic fill. BTEX compounds were also detected in the Site soils, but typically at low levels and only benzene above the NRDCSRS. These compounds may be associated with localized spills of fuel or oil or with the anthropogenic fill. Chlorobenzene was also detected in the Site soils below NRDCSRS, and are not associated with chlor-alkali production. However, chlorobenzene was used in the operations on the adjacent LPH and NOPCO sites.

Finally, Toxicity Characteristic Leaching Procedure (TCLP) testing was performed on four samples to assess whether site soils could be classified as a characteristic hazardous waste, if managed as part of implementation of a remedy. Of the four samples tested, two would be considered a characteristic hazardous waste (exceeding the limit of 0.2 mg/L mercury in TCLP extract) and two would not. The TCLP results did not correlate with mercury concentrations in the soil samples or the presence of visible mercury.

2.7.1.2 Visible Elemental Mercury

One of the considerations in an FS is to evaluate means to address the preference under the Superfund Amendments and Reauthorization Act (SARA) given to remedial actions that employ treatment technologies that reduce the volume, toxicity, or mobility of hazardous substances and contaminants, and the expectations in the NCP regarding the preference for treatment of principal threat waste, wherever practical (40 CFR 300.430(a)(iii)). To address this preference under SARA and the NCP necessitates an evaluation of the areas and/or volumes of media that may be amenable to treatment technologies. In the case of the LCP Site, this evaluation is tempered by the presence of both anthropogenic fill and former operations-related contamination. Specifically, as discussed above in Sections 2.2 and 2.7.1.1, the Site is underlain by a sizable anthropogenic fill layer of approximately 300,000 CY over nearly 22 acres which contains various constituents above NRDCSRS, and which contribute to Site-related risks. While the anthropogenic fill is considered in the remedy selection process, typically treatment-based alternatives are not selected because of the variability and scale of historic fill. Under the assumption that at the LCP Site such an outcome related to the anthropogenic/historic fill is possible as well, then an alternative basis for estimating the volume and/or area of contaminated media that could be the subject of a treatment-based or other remedial action was considered, and for the LCP Site mercury, in particular the visible elemental mercury that as previously noted is considered here to be principal threat waste, provides this alternative basis.

As described above, mercury is the principal contaminant of concern at the Site and is related to the Site's former chlor-alkali operations. In addition, mercury is also considered a persistent, bioaccumulative, and toxic substance which does not readily degrade in the environment. Based on the mercury speciation results presented in the RI, during the development of the *Human Health Risk Assessment,* it was assumed that elemental mercury comprised approximately 10% of the measured soil mercury concentration, with metacinnabar comprising the other roughly 90%. However, due to the presence of visible elemental mercury, analytical testing to determine a concentration of mercury was not possible; therefore, soil-based mercury concentrations (i.e., mg mercury per kg soil) cannot be calculated to reflect the occurrence of visible elemental mercury. This visible elemental mercury has the potential to represent a meaningful fraction of the total mass of mercury present in the Site soils (i.e. be present in a "significant" concentration in soils, as the NCP indicates could be characterized as principal threat waste).

While risk assessment calculations for visible elemental mercury are not possible given analytical limitations in the measurements of actual mercury soil concentrations in areas where visible elemental mercury is present, the risk assessment assumed that these areas of visible elemental mercury represent areas of unacceptable human health and ecological risks through both direct contact and inhalation exposure. The potential mass, unacceptable risk assumption, characterization as principal threat waste, and relationship of visible mercury to former Site operations, make areas of visible mercury a reasonable candidate for evaluation in the FS of treatment-based or other alternatives, to address the preferences expressed in SARA and the expectations in the NCP, and, therefore, a separate volume calculation was performed to estimate the quantity of soil that could contain visible, elemental mercury.

The areas of visible elemental mercury in soil at the LCP site are shown Figure 2-5, and the area and volume of this soil was calculated as follows:

- The area and volume of soil containing visible elemental mercury was estimated based on locations shown on Figure 2-5 and the maximum depth to which visible elemental mercury was observed at these locations. In areas where mercury was detected at depth, but not at the surface, the soil located above where mercury was visible was assumed to also contain visible mercury.
- As noted previously, there does not appear to have been substantial downward migration of visible mercury. In addition, a review of the mapping of the occurrence of visible mercury similarly suggests that a preponderance of the mass would exist in the more shallow soils. Further, the subsurface at the site contains numerous piles from building foundations in the area of the visible mercury. As a consequence, remediation in shallow soils would typically be more implementable than at greater depths even apart from the normal complications of increased depth in remediation (safety, slope stability, dewatering). Therefore, depth interval volume calculations were performed (see Appendix B for details) to assess the possibility of considering a subset volume of the soil containing visible mercury in the evaluation of alternatives. The depth interval calculations indicate that up to 77% of the visible mercury is contained in the upper six feet of soil – a meaningful fraction. Therefore, the volume of visible elemental mercury was calculated for two depth intervals, as follows:
    - Partial Depth (0 – 6 ft deep); and
    - Full Depth (0 – 17 ft deep), with the maximum depth based on the deepest location where visible mercury was noted.
- The volume calculations were performed by assigning polygons to the various areas and depth intervals represented by the sampling locations where visible mercury was evidenced.
- An adjustment factor of 10% was added to calculated soil volume to account for sloping of excavations so that excavation-based alternatives could also be appropriately evaluated.

Details of the volume calculation for soil containing visible elemental mercury are provided in Appendix B. The areas and volumes of this soil from these calculation are as follows (all values rounded):

- Area: 90,000 square feet (SF)
- Partial Depth (0 – 6 ft): 18,100 CY in place
- Full Depth (0 – 17 ft): 23,600 CY in place

ATTACHMENT NO. 4

REVISED SECTION 3.1

3 REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

3.1 Remedial Action Objectives

3.1.1 General

Remedial action objectives (RAOs) are medium-specific goals ~~for the protection of~~to protect human health and the environment. Remedial Alternatives are developed to meet the RAOs. The process of identifying the RAOs follows the identification of affected media and contaminant characteristics; evaluation of exposure pathways, contaminant migration pathways and exposure limits to receptors; and the evaluation of contaminant concentrations that would result in unacceptable exposure. The RAOs are based on regulatory requirements and risk-based evaluations, which may apply to the various remedial activities being considered for the site. This section of the FS reviews the affected media and contaminants that are required to be remediated. This information is combined with Federal, State and local regulations, presented in Section 4, that may affect remedial actions, to form a basis for evaluating how the alternatives meet the RAOs.

Further, PRGs are presented in Section 4.2 and are based on Federal or State promulgated ARARs and risk-based levels, with consideration also given to background concentrations and other guidelines. These PRGs are used as a benchmark in the technology screening, alternative development and screening, and detailed evaluation of alternatives presented in the subsequent sections of this FS report.

3.1.2 Identification of RAOs

As an aid in identifying the RAOs, the following is a summary of site contaminants and relevant potential risk levels by medium:

Soils: Soil impacts predominate in the anthropogenic fill, and are also present but to a lesser extent in the underlying tidal marsh deposits and glacial till. Constituents present in soil that are related to former site operations include mercury, polychlorinated naphthalenes, hexachlorobenzene, PCDFs, and PCBs. Constituents associated with the anthropogenic fill include arsenic, lead, PCDDs, PAHs, and BETX. Chlorobenzene and arsenic may also be attributable to sources adjacent to the LCP Site. These various constituents are present above PRGs. In addition, the baseline risk assessment indicated excess potential risk, principally from the presence of visible elemental mercury (not quantified but assumed to be unacceptable).

Groundwater : Groundwater impacts are evident in the overburden water-bearing zone to a limited extent from mercury (detected above groundwater quality standards in only two wells) but not from other site-operations related constituents, and also from various non-site-operations related constituents including arsenic, other metals, and various VOCs (e.g., benzene) and SVOCs. In the overburden water-bearing zone these constituents are found above PRGs, and the baseline risk assessment indicates potential excess cancer and non-cancer risks above benchmarks from consumption of groundwater. As described in Section 2.3.3, based on bedrock groundwater quality by comparison to the Class IIIB groundwater quality criteria at N.J.A.C. 7:9C-1.7(f), the bedrock water-bearing zone is generally not impacted from the site, but is impacted from the adjacent LPH site.

Sediments: Mercury is found above PRGs in the sediments of South Branch Creek and the Northern Off-Site Ditch. Other constituents above PRGs, ecological benchmarks, or reference levels in the sediments of South Branch Creek and the Northern Off-Site ditch include arsenic, PAHs, PCBs, and chlorinated benzenes. The baseline ecological risk assessment indicates the principal potential excess risk exists for benthic macroinvertibrates within South Branch Creek. In addition, the risk assessment could not quantitatively assess potential risk from visible elemental mercury; however, the presence of visible mercury is assumed to present an unacceptable risk to current and future terrestrial wildlife receptors.

Surface Water: In general surface water impacts were not evident except to the extent that sediment becomes suspended in surface water.

~~and which are also based on contaminant-specific criteria applicable to the Site. The conclusions from the remedial investigation work are the primary basis for development of the RAOs, as presented in the RI and the human health and ecological risk assessments, and summarized in Section 2. Specifically, the conclusions relevant to development of the RAOs are as follows:~~

- ~~While exposure at the Site is currently limited because of the absence of operations, and fencing that restricts access, nonetheless the potential exposure pathway for soils and associated soil vapors is considered complete. The largest contributors to potential risk for the soil pathways are ingestion of inorganic mercury and inhalation of elemental mercury.~~

- ~~Although potential risk was not quantified for visible mercury, potential exposure to areas containing visible elemental mercury is assumed to present unacceptable risks.~~

- ~~While the shallow groundwater beneath the site is not suitable for potable use, the groundwater is classified by New Jersey as IIA. Additionally, direct contact with groundwater is a potentially complete pathway.~~

- ~~The principal area of ecological concern on site is the sediment in South Branch Creek, in particular the potential risks to benthic invertebrates within the sediment.~~

Based on the above, the RAOs that will be used to guide the development and evaluation of remedial alternatives and selection of a remedy for the LCP Site are as follows:

- Prevent or minimize potential current and future human and wildlife exposures - including ingestion and dermal contact with soils and groundwater - that present a significant risk whether from site-operations-related or non-site-operations-related constituents.
- Minimize migration of contaminated groundwater, and to the extent practicable, remediate to applicable standards.
- Remediate sediment in South Branch Creek, Northern Off-Site Ditch, and associated wetlands to levels protective of biota.
- Prevent or minimize human exposure to contaminated building materials and physical hazards that may result in potentially unacceptable risk.

~~When assessing the ability of a remedial alternative to address the RAOs in a practicable and meaningful manner it will be useful to consider the following additional Site characteristics:~~

~~Various constituents are found in concentrations above the NRDCSRS Site-wide as a result of the presence of anthropogenic fill.~~

~~While groundwater is classified as IIA, it could not actually be used as a potable supply because of other applicable regulations.~~

~~Mercury is present principally in low solubility (elemental) and insoluble (mercuric sulfide) forms and is, therefore, largely immobile under existing conditions.~~